Utah Center of Excellence for the Development of the Hydrocarbon Resources of the Uinta Basin

Centers of Excellence Review

Miller Business Center

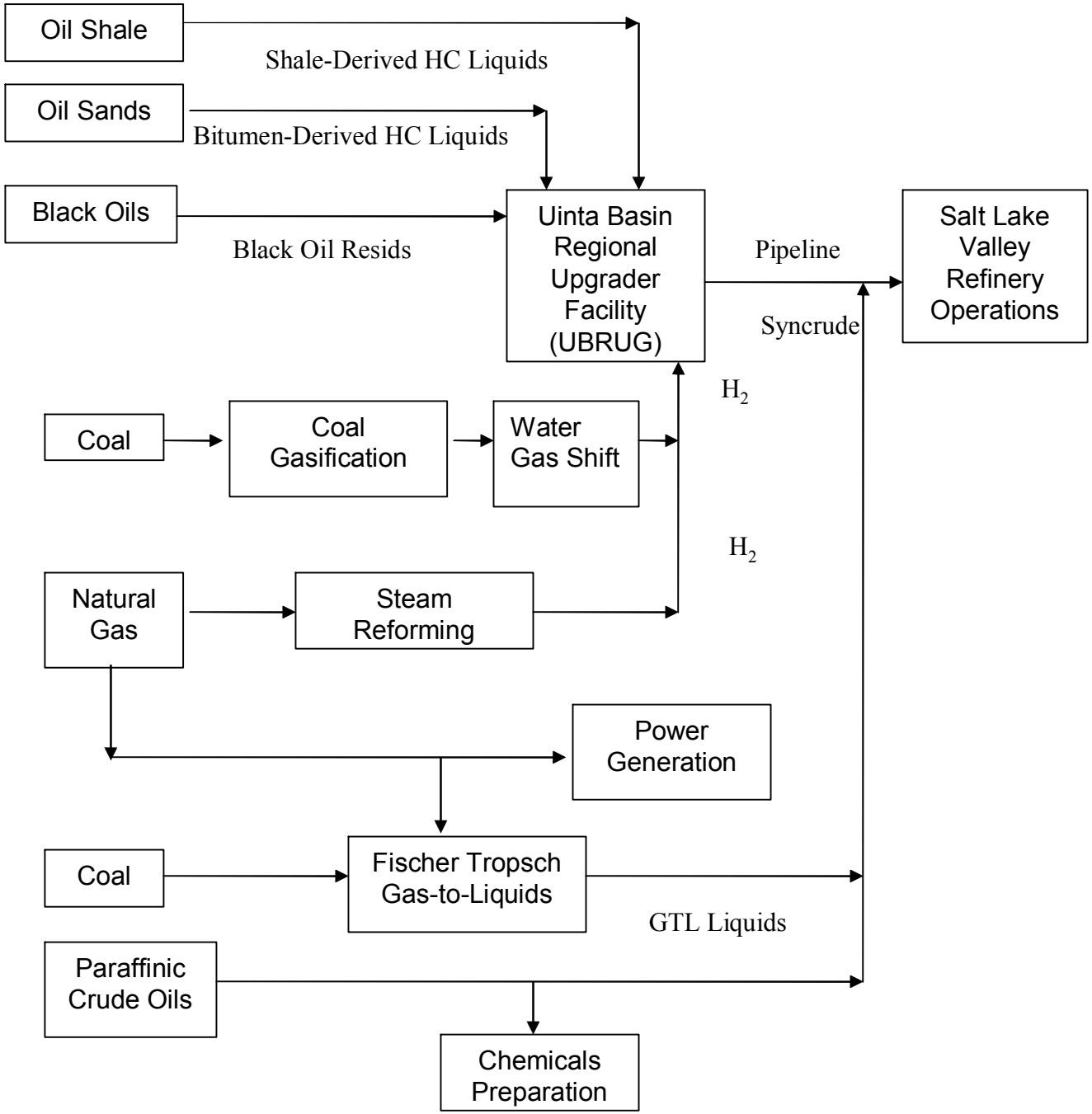
May 10, 2005

Utilization of Utah's Untapped Hydrocarbon Resources

- **Uinta Basin Oil Shale/Oil Sands Can Supply 50,000-100,000 BBLS of Syncrude per Day**
- **@ $50/BBL $2.5-$5.0 MM/Day or $900 MM-$1.8 B/Year in Potential Revenue**
- **@ 7/1 Economic Benefits Ratio $6 B/yr-$13 B/yr for Utah Economy**

Utilization of Utah's Untapped Hydrocarbon Resources Phase I

- **Recover 10,000-15,000 BPD of Shale Oil from 2-3 Sites**
- **Recover 2,500-8,000 BPD of Oil Sands Liquids from 2-3 Sites**
- **Uinta Basin Central Hydrotreater to Produce Low Sulfur/ Nitrogen Syncrude**
- **Refine Syncrude in Salt Lake City Refineries**


Oil Shale
Shale-Derived HC Liquids
Oil Sands
Bitumen-Derived HC Liquids
Black Oils
Black Oil Resids
Uinta Basin Regional Upgrader Facility (UBRUG)
Pipeline
Syncrude
Salt Lake Valley Refinery Operations
H2
Coal
Coal Gasification
Water Gas Shift
H2
Natural Gas
Steam Reforming
Power Generation
Coal
Fischer Tropsch Gas-to-Liquids
GTL Liquids
Paraffinic Crude Oils
Chemicals Preparation

Impact of Uinta Basin Oil Shale and Oil Sands Development

- **30,000 BPD of Canadian Oil Sand Syncrude are Processed in Utah Refineries**
- **Uinta Basin Could Produce 50,000 BPD of Syncrude in a Phase I Development**
- **Uinta Basin Could Produce 100,000 BPD of Syncrude in a Phase II Development**

Thus Oil Shale and Oil Sands Syncrude Could Replace the Canadian Syncrude in Salt Lake City Refinery Crude Slates

Comparison of Shale Oil, Bitumen-Derived Liquid and Canadian Syncrude Properties

	UB Shale Oil	UB Oil Sand Liquids	Canada Syncrude
Gravity, °API	25.0	18.5	33.1
Nitrogen, ppm	19,700	10,200	520
Sulfur, wt%	0.67	0.32	0.109
CCR, wt%	3.6	4.7	0.08

Comparison of Hydrotreated UB Bitumen-Derived Liquid and Canadian Syncrude Properties

	Uinta Basin Oil Sand Liquids		Canada Syncrude
Temperature, K	663	679	--------
Gravity, °API	26.9	35.0	33.1
Nitrogen, ppm	148	43	520
Sulfur, ppm	45	16	1,090
CCR, wt%	<0.1	<0.1	0.08

The UB Shale Oils & BDL can be Converted to Syncrudes that can be Refined in any Refinery

COE Deliverables Related to the Development of Uinta Basin Oil Shale and Oil Sands

Capability for an Engineering Firm to Design Recovery & Upgrading Plants for the Development of Uinta Basin Oil Shale & Oil Sands Resources

COE Deliverables Related to the Development of Uinta Basin Oil Shale and Oil Sands

- **Revised Oil Sand & Oil Shale Resource Estimates on Potential Development Sites**
  - **Total Resource**
    1. **Measured**
    2. **Indicated**
    3. **Inferred/Conjectured**

- **Identification of Lease Structure for Each Potential Development Site**
    1. **Private/Fee Leases**
    2. **State Leases**
    3. **Federal Leases**
    4. **Tribal leases**

COE Deliverables Related to the Development of Uinta Basin Oil Shale and Oil Sands

- **Recommendation of Site-Specific Recovery Technologies for Potential Development Sites**
    1. **Ex-situ Thermal Recovery Processes**
    2. **Ex-situ Extraction Processes**
    3. **In-situ Recovery Processes**

- **Process Requirements to Remove Sulfur and Nitrogen & to Reduce CCR and Residual Fraction of the Produced Oils**
    1. **Preferred Catalyst**
    2. **Temperature**
    3. **Pressure**
    4. **Liquid/Weight Hourly Space Velocities**
    5. **Hydrogen Consumption**

Impact of Uinta Basin Oil Shale and Oil Sands Development

Uinta Basin Could Produce 50,000 BPD from Oil Shale and Oil Sands in Phase I & Possibly 100,000 BPD in a Phase II Development

Uinta Basin Development Concept
Where and How?

Multiple Oil Shale Recovery Sites:

3-5 @	**10,000 to 15,000 Barrels/Day**

Multiple Oil Sand Recovery Sites:

Asphalt Ridge	**4,000 to 8,000 Barrels/Day**
Whiterocks	**2,500 to 5,000 Barrels/Day**
PR Spring	**2,500 to 5,000 Barrels/Day**

Black Oil Production

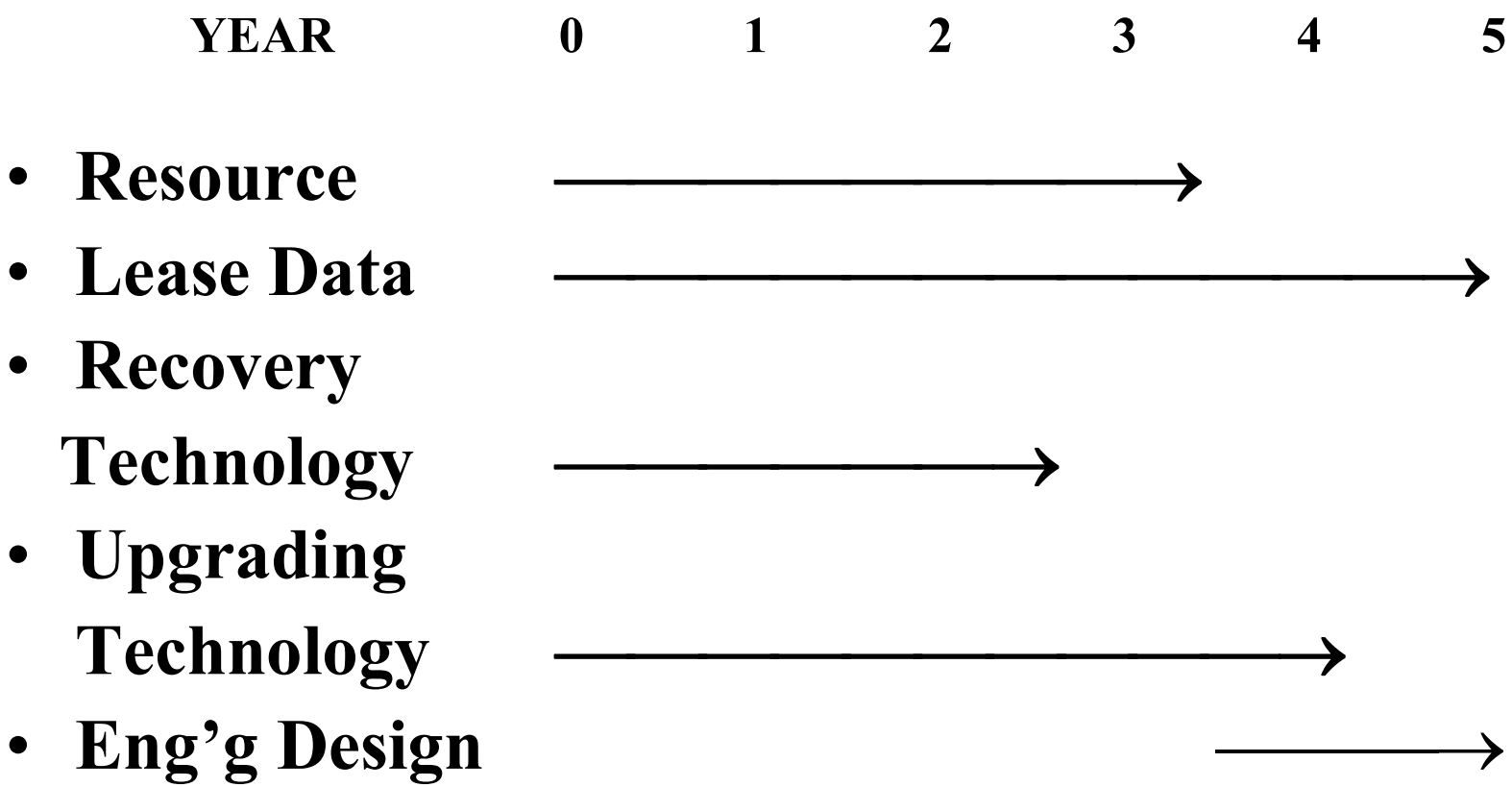
Uinta Basin	**5,000 to 7,500 Barrels/Day**

50,000 – 100,000 Barrels/Day

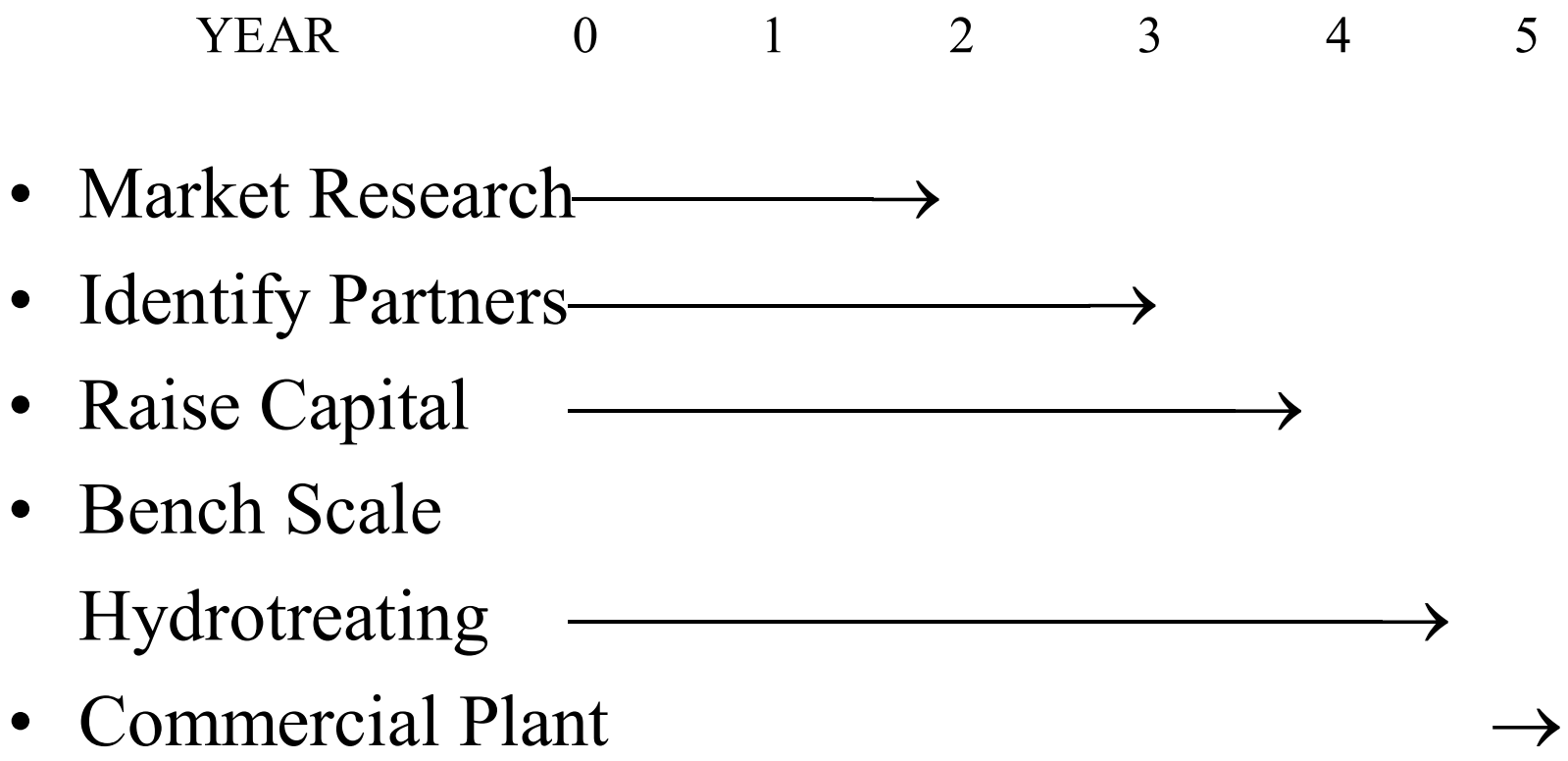
Initial Market Opportunity

- **Replace 30,000 BPD of Canadian Syncrude**
- **Salt Lake City Refineries Purchase Canadian Syncrude at $57.50/BBL Delivered (April 2005)**
- **50-100 M BPD @ $50/BBL $2.5-$5.0 MM/Day or $900 MM-$1.8 B/Year in Potential Revenue**
- **Capital Required $60 MM-$120 MM**
- **@ 10% Net Income ⇒ Breakeven ~ 1 Year**

Technical Development Time Line



Commercial Development Time Line



COE Funding Milestones

Budget Category	2005	2006	2007	2008	2009
Total Personnel	110,640	110,640	110,640	110,640	110,640
Equipment	10,000	10,000	10,000	10,000	10,000
Subcontracts	13,000	13,000	13,000	13,000	13,000
General Supplies	6,360	6,360	6,360	6,360	6,360
Total Budget	140,000	140,000	140,000	140,000	140,000